

FCC REPORT

Applicant: Grand Electronics, INC

Address of Applicant: 11650 Brentcross Dr, 11650, Tomball, Texas 77377, United States

Manufacturer/ Factory: Shen zhen BAKER Electronics Co.LTD

Address of Manufacturer/ Factory: 6/F.A.Building,The first industrial area of Fenghuang,Fuyong,Bao'an,Shenzhen,China

Equipment Under Test (EUT)

Product Name: 2.4G Action Camera Remote Bracelet

Model No.: LNRW1

Trade Mark: neutab.

FCC ID: 2AGNK-LNRW1

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249:2016

Date of sample receipt: May 17, 2017

Date of Test: May 18-22, 2017

Date of report issued: May 23, 2017

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Lo

Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	May 23, 2017	Original

Prepared By: Tiger Chen **Date:** May 23, 2017
Project Engineer

Check By: Andy Wu **Date:** May 23, 2017
Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	N/A
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Pass: The EUT complies with the essential requirements in the standard.

N/A: Not applicable

Remark: Test according to ANSI C63.10: 2013.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

5 General Information

5.1 General Description of EUT

Product Name:	2.4G Action Camera Remote Bracelet
Model No.:	LNRW1
Operation Frequency:	2442MHz
Channel numbers:	1
Modulation type:	GFSK
Antenna Type:	PCB antenna
Antenna gain:	1dBi (Declared by Applicant)
Power supply:	DC 6V (2*3.0V CR2016 Lithium Cell Battery)

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
<i>Remark: During the test, new battery is used during all test.</i>	

Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	90.95	91.43	91.06

5.3 Description of Support Units

None.

5.4 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● FCC —Registration No.: 600491 Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 22, 2016. ● Industry Canada (IC) —Registration No.: 9079A-2 The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016
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5.5 Test Location

All tests were performed at:
<p>Global United Technology Services Co., Ltd. Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960</p>

5.6 Other Information Requested by the Customer

None.

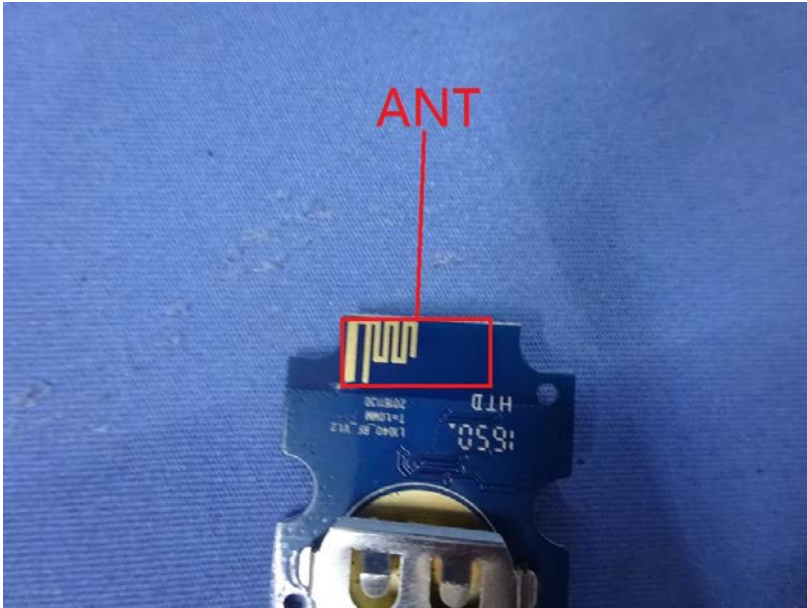
6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 03 2015	July 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June 29 2016	June 28 2017
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 29 2016	June 28 2017
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 29 2016	June 28 2017
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 29 2016	June 28 2017
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 29 2016	June 28 2017
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	June 29 2016	June 28 2017
10	Coaxial Cable	GTS	N/A	GTS211	June 29 2016	June 28 2017
11	Coaxial cable	GTS	N/A	GTS210	June 29 2016	June 28 2017
12	Coaxial Cable	GTS	N/A	GTS212	June 29 2016	June 28 2017
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 29 2016	June 28 2017
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 29 2016	June 28 2017
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 29 2016	June 28 2017
16	Band filter	Amindeon	82346	GTS219	June 29 2016	June 28 2017
17	Power Meter	Anritsu	ML2495A	GTS540	June 29 2016	June 28 2017
18	Power Sensor	Anritsu	MA2411B	GTS541	June 29 2016	June 28 2017

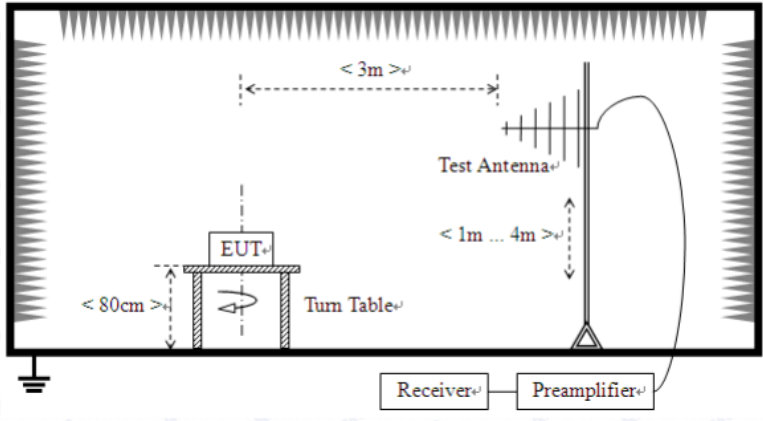
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	ChangChun	DYM3	GTS257	June 29 2016	June 28 2017

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
<p>15.203 requirement:</p> <p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p>	
EUT Antenna:	
<p><i>The antenna is PCB antenna, the best case gain of the antenna is 1dBi</i></p> 	

7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	30MHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	2400MHz-2483.5MHz	94.00		Average Value	
Limit: (Spurious Emissions)	Frequency	Limit (dBuV/m @3m)		Remark	
	30MHz-88MHz	40.00		Quasi-peak Value	
	88MHz-216MHz	43.50		Quasi-peak Value	
	216MHz-960MHz	46.00		Quasi-peak Value	
	960MHz-1GHz	54.00		Quasi-peak Value	
	Above 1GHz	54.00		Average Value	
74.00		Peak Value			
Limit: (band edge)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.				
Test setup:	Below 1GHz				
					
	Above 1GHz				

	<p>The diagram illustrates the test setup. An EUT (Electromagnetic Under Test) is placed on a turn table with a diameter of less than 150 cm. The turn table is rotated 360 degrees. The EUT is positioned 3 meters away from a test antenna. The test antenna is mounted on a variable-height antenna tower, with the height adjustable from 1 meter to 4 meters. The test antenna is connected to a receiver and a preamplifier system.</p>
<p>Test Procedure:</p>	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
<p>Test Instruments:</p>	<p>Refer to section 6.0 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.2 for details</p>
<p>Test results:</p>	<p>Pass</p>

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2442.00	92.48	27.48	5.43	33.96	91.43	114.00	-22.57	Horizontal
2442.00	90.17	27.48	5.43	33.96	89.12	114.00	-24.88	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2442.00	74.28	27.48	5.43	33.96	73.23	94.00	-20.77	Horizontal
2442.00	73.31	27.48	5.43	33.96	72.26	94.00	-21.74	Vertical

NOTE: RBW 3MHz VBW 3MHz Peak detector is for PK Value , RMS detector is for AV value

7.2.2 Spurious emissions

■ Below 1GHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
37.16	25.74	11.20	0.63	30.06	7.51	40.00	-32.49	Vertical
93.11	24.15	10.98	1.14	29.73	6.54	43.50	-36.96	Vertical
133.62	29.39	7.83	1.46	29.49	9.19	43.50	-34.31	Vertical
230.10	25.49	11.17	2.02	29.48	9.20	46.00	-36.80	Vertical
337.22	23.36	14.21	2.56	29.79	10.34	46.00	-35.66	Vertical
582.74	22.61	18.98	3.66	29.30	15.95	46.00	-30.05	Vertical
39.02	24.72	12.30	0.65	30.05	7.62	40.00	-32.38	Horizontal
96.44	24.45	11.35	1.16	29.72	7.24	43.50	-36.26	Horizontal
148.96	25.89	7.50	1.56	29.41	5.54	43.50	-37.96	Horizontal
221.39	29.30	10.88	1.97	29.40	12.75	46.00	-33.25	Horizontal
382.59	22.98	15.15	2.77	29.58	11.32	46.00	-34.68	Horizontal
618.54	23.66	19.39	3.80	29.28	17.57	46.00	-28.43	Horizontal

■ Above 1GHz

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4884.00	38.71	31.86	8.67	37.68	41.56	74.00	-32.44	Vertical
7326.00	47.86	36.41	11.72	35.64	60.35	74.00	-13.65	Vertical
9768.00	30.41	38.35	14.27	34.99	48.04	74.00	-25.96	Vertical
12210.00						74.00		Vertical
14652.00						74.00		Vertical
4884.00	38.99	31.86	8.67	37.68	41.84	74.00	-32.16	Horizontal
7326.00	45.76	36.41	11.72	35.64	58.25	74.00	-15.75	Horizontal
9768.00	29.59	38.35	14.27	34.99	47.22	74.00	-26.78	Horizontal
12210.00						74.00		Horizontal
14652.00						74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4884.00	28.66	31.86	8.67	37.68	31.51	54.00	-22.49	Vertical
7326.00	33.73	36.41	11.72	35.64	49.22	54.00	-7.78	Vertical
9768.00	22.11	38.35	14.27	34.99	39.74	54.00	-14.26	Vertical
12210.00						54.00		Vertical
14652.00						54.00		Vertical
4884.00	27.46	31.86	8.67	37.68	30.31	54.00	-23.69	Horizontal
7326.00	36.63	36.41	11.72	35.64	49.12	54.00	-4.88	Horizontal
9768.00	21.48	38.35	14.27	34.99	39.11	54.00	-14.89	Horizontal
12210.00						54.00		Horizontal
14652.00						54.00		Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.

7.2.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case was exhibited.

Test channel:	Lowest channel
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	45.40	27.59	5.38	30.18	48.19	74.00	-25.81	Horizontal
2400.00	45.55	27.58	5.39	30.18	48.34	74.00	-25.66	Horizontal
2390.00	46.19	27.59	5.38	30.18	48.98	74.00	-25.02	Vertical
2400.00	46.86	27.58	5.39	30.18	49.65	74.00	-24.35	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	35.38	27.59	5.38	30.18	38.17	54.00	-15.83	Horizontal
2400.00	36.77	27.58	5.39	30.18	39.56	54.00	-14.44	Horizontal
2390.00	35.51	27.59	5.38	30.18	38.30	54.00	-15.70	Vertical
2400.00	37.66	27.58	5.39	30.18	40.45	54.00	-13.55	Vertical

Test channel:	Highest channel
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	47.81	27.53	5.47	29.93	50.88	74.00	-23.12	Horizontal
2500.00	46.50	27.55	5.49	29.93	49.61	74.00	-24.39	Horizontal
2483.50	49.07	27.53	5.47	29.93	52.14	74.00	-21.86	Vertical
2500.00	47.74	27.55	5.49	29.93	50.85	74.00	-23.15	Vertical

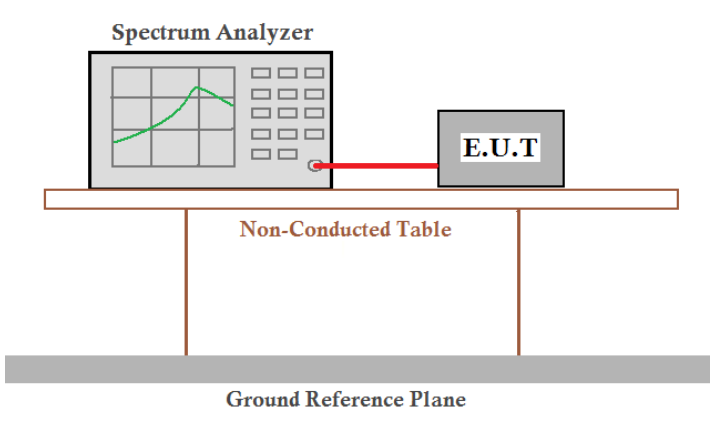
Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	38.24	27.53	5.47	29.93	41.31	54.00	-12.69	Horizontal
2500.00	35.88	27.55	5.49	29.93	38.99	54.00	-15.01	Horizontal
2483.50	39.66	27.53	5.47	29.93	42.73	54.00	-11.27	Vertical
2500.00	36.01	27.55	5.49	29.93	39.12	54.00	-14.88	Vertical

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor

7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Test channel	20dB bandwidth(MHz)	Result
2442MHz	1.919	Pass

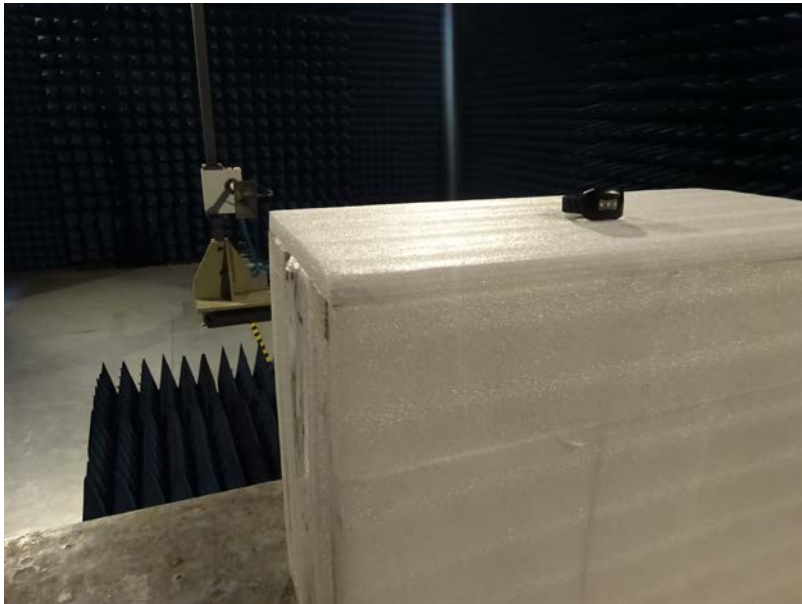
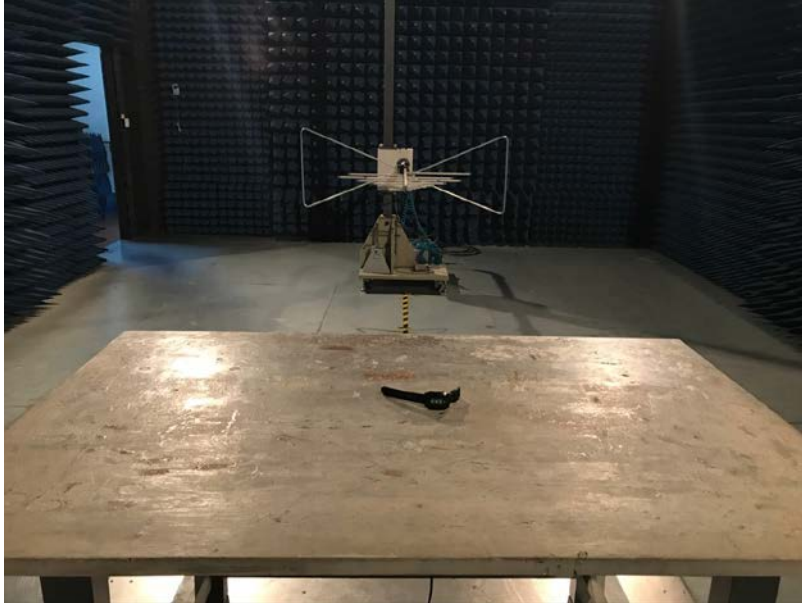
Test plot as follows:



2442MHz

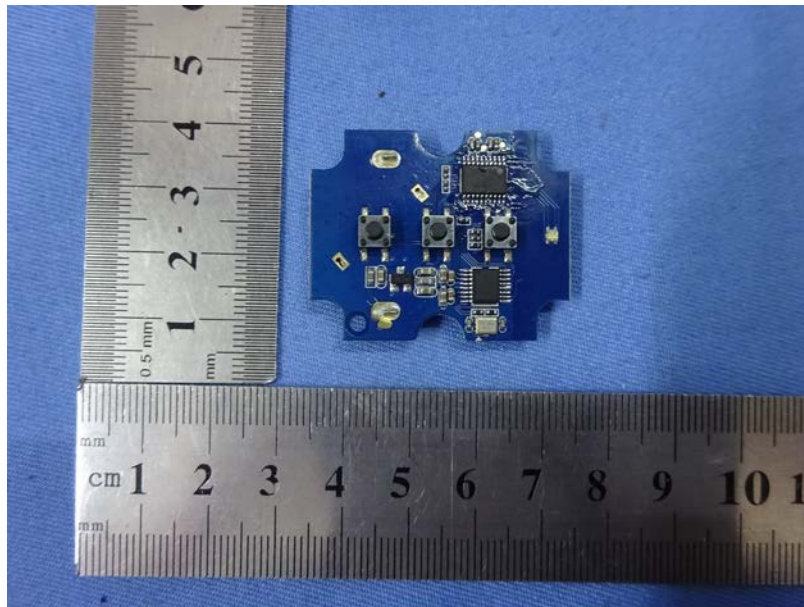
8 Test Setup Photo

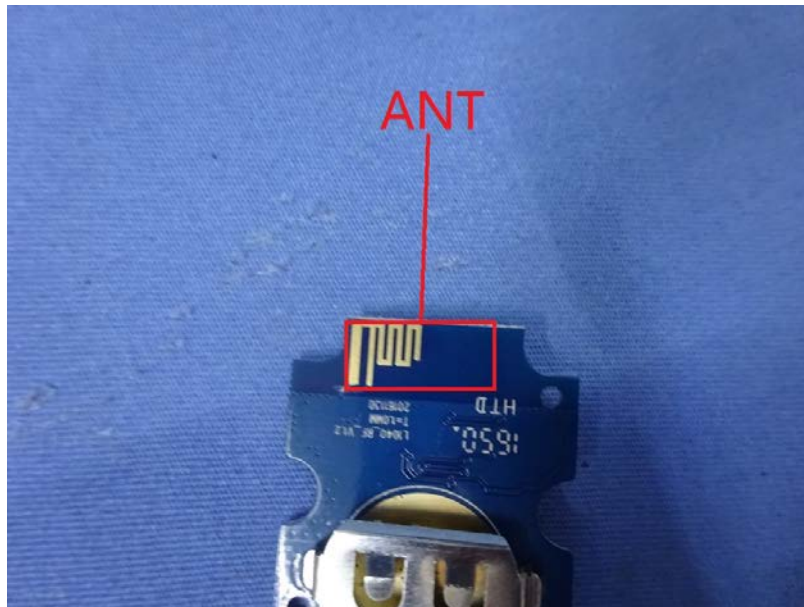
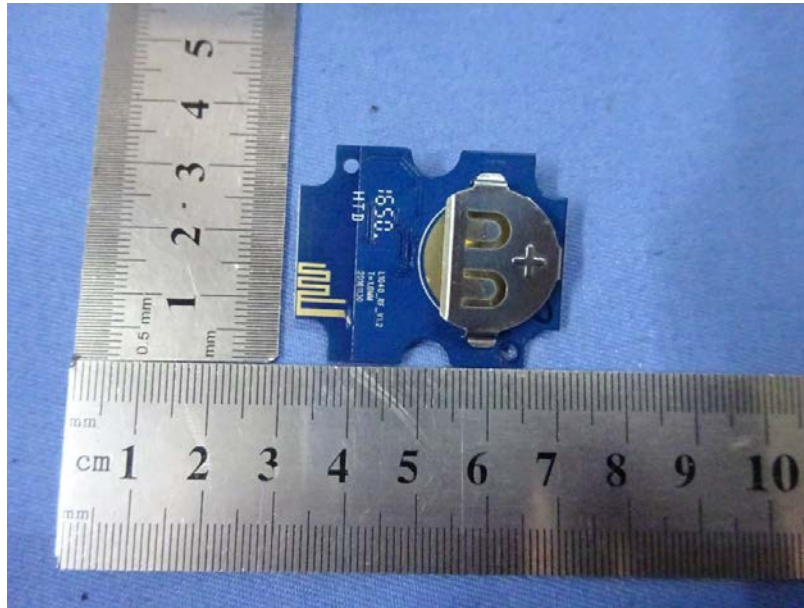
Radiated Emission



9 EUT Constructional Details









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